



SOCIETY OF PETROLEUM ENGINEERS
SPE NEWS
COPENHAGEN SECTION

FROM THE SECTION CHAIRPERSON

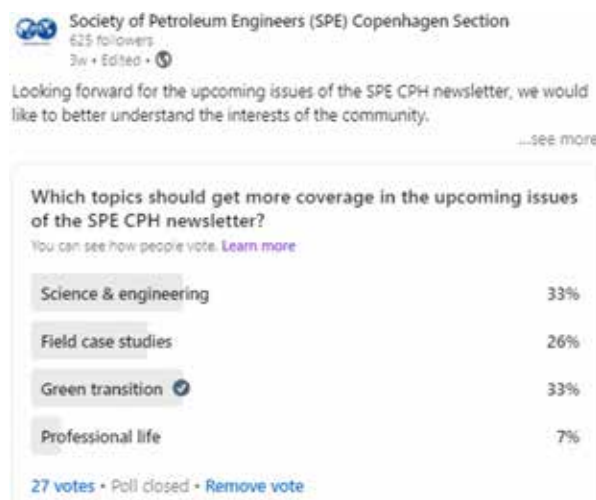
Dear SPE Copenhagen Members,

First off, I wish to say a big thank you for your participation and engagement at our section events so far. It is highly encouraging to see. I also wish to thank Maersk drilling for hosting the face-to-face event in September which was memorable in many respects. The presentation prompted a lot of interest and discussion. We had a 'kahoot' quiz where the winner won bragging rights. Some good food and drinks too... my biggest take-away from the event was how much we had all missed meeting each other face-to-face.

The most recent event on the 27th October was virtual and hosted by DTU. Three high quality and informative presentations were delivered and similarly, there was good engagement and participation by the audience. SPE CPH will continue to conduct events with topics of high relevance to our profession and the transition.

LinkedIn Survey Results

Thanks for your giving your time and responding to the recent LinkedIn survey. The results show an interest in energy transition related topics and general science and engineering.



The results provide valuable input that will be used to organize more high-quality and targeted events in line with this season's focus areas. Note that you can expect more of such in the future and your input is always welcome. Endeavour to visit the SPE CPH linkedin page to keep up to date on information related to our section and upcoming events.

Membership Renewal

We look forward to you continuing your SPE membership. There is no doubt that in the last year, we have all faced many new challenges but through it all, we have continued to inspire and support each other. We as a board will continuously work towards bringing greater value to your membership.

Bonus: Renew your membership today and receive 6 Free paper downloads in OnePetro®, worth \$48!

To renew your membership, visit [SPE.org](http://go.spe.org). or click on the link: <http://go.spe.org/sectionrenew>

With that said, please dive in and enjoy the newsletter. Looking forward to more events and interactions with you!

Yours Sincerely,
Adebowale Solarin

SPE Copenhagen Section Chairman 2021/22

Please remember to pay your SPE dues. If you are in work transit, please check the link <https://www.spe.org/en/members/transition/>



Please follow us on LinkedIn to be up to date on SPE Cph events and other great stories:

<https://www.linkedin.com/company/spe-copenhagen-section>

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Applying oilfield experience to the renewable energy sector

Energy has been one of the key focus areas of COP26, the United Nations Climate Change Conference 2021, where global leaders have looked for ways to increase the efforts that go into accelerating development of renewable energies like wind, geothermal, carbon capture storage (CCS), and Power to X (hydrogen) systems.

With the demand for non-intermittent electricity supply, renewable energy sources like geothermal are receiving a growing amount of attention for potential as a baseload source of power which can stabilize supply when paired with wind or solar.

Development of further geothermal resources for power generation is expected to deliver new capacity additions of up to 1,500 MW in the next two to three years. ThinkGeoEnergy estimates that by 2026 the overall increase can reach up to 4,000 MW in additional power generation capacity.

As a leading technology partner to the energy industry, Welltec® takes a proactive role in facilitating progress and change.



Welltec taking part in a panel discussion at the World Geothermal Congress 2020+1 in Reykjavik.

Like many other upstream technology and service providers, Welltec sees an opportunity to provide and further develop competence, especially within advanced well completion and intervention technologies.

There is also a growing realization and interest from the geothermal community to utilize Welltec's 25-plus years of global oil and gas experience to optimize project value and profitability.



Fabio Rosas Gutterres, on the SPE live panel, November 2021.

Geothermal well design

In terms of design requirements, there are many similarities between the accomplishments of oil and gas and the challenges being faced in geothermal.

While the temperatures dealt with in oil and gas are not as extreme as those found in some geothermal projects, other challenges such as high pressure, corrosive environment, harsh offshore conditions, or complex geological settings have been overcome – lessons which are no doubt of great value.

Reducing risk and improving profitability

In order to grow, the geothermal sector will require large investments and an increased recruitment of sub-surface experience, and the expertise of service providers.

When it comes to well design and planning, the geothermal sector has a need to simplify solutions and be able to select well completion designs prepared to handle the high subsurface uncertainties (especially those often seen in volcanic areas), and minimize the rig time and number of workovers required over the life of a well.

As seen in the oil and gas sector, a robust well construction can be standardized and reduce the risks associated with investment, and secure returns.

Technology transfer to prolong well life

As geothermal technology continues to develop, oil and gas completion solutions can offer the growing geothermal market the option to not only revive existing shut-in wells, but also develop new wells with a prolonged and reliable lifespan ►►

► Welltec has been adapting its expertise from the hydrocarbon sector and applying it to geothermal energy, enabling operators to optimize well design while minimizing the risks and challenges associated with subsurface uncertainties.



Welltec Annular Barrier (WAB®) – qualified and tested to the highest industry standards.

Existing wells are often vertical, but with more geothermal projects having a limited space on the surface, an increased demand for directional drilling is expected. This is especially relevant in the case of heating projects in urban areas or with enhanced geothermal systems (EGS).

The primary requirement for a geothermal well is a hydrothermal system with sufficient water or steam trapped in a permeable formation.

Geothermal wells can be either vertical or directional, with a depth dramatically dependent on the geographical region. To fully utilize the capacity of global geothermal energy in regions with no volcanic activity, drilling can be required to depths of more than 6 km to reach sufficient heat for power generation.

Here, Welltec can bring experience from the oil and gas industry and play a significant role in creating horizontal systems with multi-zonal isolation, and help operators take full advantage of the formation heat conductivity.

Improving well integrity

It is not just through technology that Welltec can share experience.

As with oil and gas, geothermal operators require drilling in open hole, as well as a certain degree of well cementing in order to achieve casing integrity. The oil and gas industry has been highly regulated on this, and similar standards are now being established for geothermal operators.

Extensive experience of preventing the undesired migration of fluids or gases can also be transferred to geothermal well construction.

In geothermal wells, a Welltec Annular Barrier (WAB®) can be used to provide a base for cement to cover a damaged or leaking casing. Such packer technology traditionally used within oil and gas has since been modified and qualified for geothermal applications to prevent trapped fluid, steam, or gas during relining, and finally mitigate for the extreme thermal cycling over the life of the well.

In new geothermal wells, the packers are used as cement assurance to isolate loss zones, or a cold feed zone, guaranteeing the integrity of the casing.



Welltec Annular Barrier (WAB®) deployment.

Welltec is taking an active role to help manage challenges in geothermal systems and the next step is carbon capture storage and hydrogen wells.

Biographies



Fabio Rosas Gutterres,
Technical Manager,
Well Completion
Operations

Completions engineer and well designer with 19 years of comprehensive energy industry experience, Fabio has both the technical and hands-on operational background needed to overcome novel challenges. Working from Welltec HQ in Denmark, Fabio provides technical expertise and support worldwide to deliver tangible results through a solutions-oriented approach in support of energy transition activities.



Mette Lind Fürstnow,
Solutions Director,
Green Initiatives

Reservoir engineer with more than 25 years of experience in corporate field development functions and consultancy within the energy industry. Mette provides technical assurance and drives Welltec initiatives to deliver well completion solutions reducing cost, risk, and uncertainties to the global energy transition.



Meeting Tuesday NOVEMBER 30

PROGRAMME

17:00 – 17:30
DRINKS

17:30 – 18:15
GUIDED TOUR THROUGH
MANUFACTURING

18:15 – 19:15
PRESENTATION

19:15 – 21:00
DINNER

LOCATION

WELLTEC A/S
GYDEVANG 25
3450 ALLERØD

TOPIC

“Applying oilfield experience to
the renewable energy sector”

SPEAKERS

Fabio Rosas Gutterres,
Technical Manager,
Well Completion Operations

Mette Lind Fürstnow,
Solutions Director,
Green Initiatives

ENTRANCE FEE

None

REGISTRATION

Please indicate your attendance
by Friday 26 November by signing
up on the internet
www.spe-cph.dk.

Welltec®

Register [HERE](#)

November 30	MAIN SPEAKER
TOPIC	Applying oilfield experience to the renewable energy sector
SPEAKER	Fabio Rosas Gutterres, Technical Manager, Well Completion Operations Mette Lind Fürstnow, Solutions Director, Green Initiatives
LOCATION	Welltec
SPONSOR	Welltec
December 2	MAIN SPEAKER
TOPIC	What Does the Future Look Like for the Oil & Gas and Energy Sector – the Energy Transition
SPEAKER	Ian Phillips, Pale Blue Dot Energy Limited, Aberdeen, Scotland
LOCATION	Virtual
SPONSOR	SPE
December 9	MAIN SPEAKER
TOPIC	Energy Transition Outlook – short and long term
SPEAKER	Jo Husebye, Rystad Partner, Consulting
LOCATION	Noreco Oil Denmark A/S, Vibenshuset, Lyngbyvej 2, DK – 2100 Copenhagen Please enter via the reception
SPONSOR	Noreco Oil Denmark A/S
January TBD	MAIN SPEAKER
TOPIC	
SPEAKER	Susanne Poulsen / Lars Petersen
LOCATION	VIRTUAL MEETING
SPONSOR	Maersk Holding
February TBD	MAIN SPEAKER
TOPIC	
SPEAKER	
LOCATION	TBD
SPONSOR	Calsep
March TBD	MAIN SPEAKER
TOPIC	
SPEAKER	
LOCATION	
SPONSOR	
April TBD	MAIN SPEAKER
TOPIC	
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May TBD	MAIN SPEAKER
TOPIC	
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June TBD	MAIN SPEAKER
TOPIC	
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MEETING DECEMBER 2

What Does the Future Look Like for the Oil & Gas and Energy Sector – The Energy Transition



[Register HERE](#)

Abstract

Ian Phillips
Pale Blue Dot Energy Limited,
Aberdeen, Scotland

This presentation considers the future of the oil and gas industry from two perspectives.

The first half paints a picture of an industry in extremely good health and with an exciting future - global population continues to grow and individuals' standard of living continues to rise - so demand for energy is growing steadily. Despite this growing demand, global proven reserves have risen as technology improves. In addition, we know where there is a lot more oil and gas in deposits that are currently uneconomic, but a small increase in the oil price would make these "proven reserves." In a nutshell, the industry might have a bright future.

The second half presents the significant obstacle: summarizing the science of climate change and considering what happened when temperature rose this high in the past. The emerging alternatives, renewables, energy efficiency, and some dramatic scientific advances in "clean hydrocarbons," will also be reviewed.

The presentation closes with an assessment of the impact of these competing forces on the oil and gas industry, the developed world, and the human race.

Biography

Ian Phillips has over 30 years of experience in the upstream oil and gas industry with operators and service companies.

In 2007 he became a founding Director of CO2DeepStore Limited - now Pale Blue Dot Energy Limited - the first company specifically seeking to deliver CCS as a service.

He holds an M.Sc. in Petroleum Engineering from Heriot Watt University and an MBA. He is also a Fellow of the UK Energy Institute and is a Chartered Petroleum Engineer.

He recently completed 4 years as chair of the SPE Aberdeen Section and was previously North Sea Regional Director on the SPEI Board. He is an SPE Distinguished Member.

Biography



Jo Husebye – Partner, Consulting

Jo Husebye is a Partner in Rystad Energy's consulting division, with extensive experience in oil and gas strategy advisory. He has led numerous projects for international oil and gas companies, oil service companies, investors and organizations during his 10 years in this role. His areas of expertise include energy macro and energy transition, global and regional gas markets, GHG emissions from the oil and gas industry, E&P strategy and oil service industry analysis. Jo has also worked as a research scientist for Sintef Energy Research, focused on gas technologies and optimization of carbon capture, transport and storage. He holds an MSc in Industrial Economics and Technology Management from the Norwegian University of Science & Technology, specializing in finance and real option valuation.

Meeting Thursday DECEMBER 9

PROGRAMME

17:00 - 18:00

Drinks and networking

18:00 - 19:00

Presentation

19:00 - 20:00

Tapas

VENUE

Noreco Oil Denmark A/S
Vibenshuset, Lyngbyvej 2,
DK – 2100 Copenhagen
Please enter via the reception

PRESENTATION

Energy Transition Outlook
– short and long term

THE PRESENTATION WILL

COVER:

- Recent events in oil and gas markets
- Energy transition scenarios
- Implications for oil & gas and DCS

SPEAKER

Jo Husebye, Rystad Partner,
Consulting

REGISTRATION

Please sign up for the meeting
before December 3, 2021.

SPONSOR



NORECO

[Register HERE](#)

Be careful and meticulous in your work, then you will get useful results

Dan Olsen is an emeritus petrophysicist at Geological Survey of Denmark and Greenland (GEUS), where he is working at the Core Analysis Laboratory. Throughout his career, Dan has contributed to multiple oil & gas and CCS projects by planning and running sophisticated core flooding experiments as well as designing the customized laboratory equipment. We asked Dan to share his views on the knowledge transfer from oil & gas projects to the green transition applications.

How does the experience and know-how in oil & gas help in green transition applications?

Until recently I was laboratory manager in the Core Analysis Laboratory. I have been in the Laboratory for approximately 36 years, and I have myself built a large part of the instruments in the laboratory, which became more and more advanced through the years. At the moment, we have three experimental rigs that can work at reservoir conditions as in the North Sea. They were originally intended for experiments related to oil and gas exploration and production. But it turns out as the green energy transition come into view that the rigs are actually quite useful also for experiments related to CO₂ storage and geothermal heat exploration.

Within the Project Greensand , we have recently conducted experiments, which are related to storage of CO₂ in the glauconitic sandstones of a depleted offshore oilfield in the North Sea. As I see it, our experimental equipment will also be useful for similar experiments related to CCS in ordinary sandstones, for example, from the Gassum formation, and probably also in the chalk formations, which are very widespread in the Danish area. This is where I can see a good use of our present knowledge – to pave the way for using our sandstone and chalk reservoirs as storage for CO₂.



The focus on CO₂ storage has arisen relatively recently, and before that CO₂ injection was mainly studied in the EOR context. What were the most interesting findings from the CO₂ EOR studies you have worked on, and why did these projects not materialize in Denmark?

It all started with experiments to see how CO₂ would work in the rocks that are found in the Danish subsurface. We knew already that CO₂ injection could be very successful indeed from operations in the United States. The first major CO₂ project I was involved in was the Weyburn CO₂ injection Project . The CO₂ injection in Weyburn oilfield in Canada proved to be very successful as significant incremental amounts of oil were produced. After that DONG sponsored an experimental project on the Syd Arne field offshore Denmark, which demonstrated that CO₂ injection leads to significantly increased oil recovery also in chalk.

The experiments so far had only involved un-fractured chalk. But in the Joint Chalk Research Program from 2012 to 2017 we proceeded to study fractured chalk. Our concern was that the CO₂ will tend to rush through the fractures and perhaps not be very efficient in recovering the oil from the matrix. But it turned out that CO₂ diffusion from the fractures into the matrix provided a large additional recovery in the samples. So it proved that CO₂ »

► was also very efficient for enhancing the oil recovery from fractured chalk.

In my view, there are two main reasons that CO₂ EOR did not become operational in the Danish oil fields. First, there was simply no supplier that could provide the required amounts of CO₂, and there were also problems with transporting the CO₂. Second, I believe that there was an expectation from the oil companies that they would get some economic support from the public, e.g. as some credit on the CO₂ quotas or similar. This was not offered by the Danish state, and therefore the projects were not economically feasible. However, this is entirely my own view.

But it's a pity that CO₂ EOR did not materialize, because we could get rid of a lot of CO₂, and the enhanced oil recovery could pay for it. Some CO₂ would be produced during CO₂ EOR operation, but it is fairly easy to catch it, re-inject it into the reservoir, and so obtain further oil recovery. So CO₂ EOR would be a win-win situation. If there is a political will to remove the CO₂ from the atmosphere, then CO₂ EOR could be an economically attractive alternative or supplement to CCS.

Working in the lab, do you see that you deliver some critical pieces of information which influence decisions for field development?

Speaking again on the Project Greensand, the main concern of the operating company (INEOS) was that the injected CO₂ could react with the reservoir rock causing pore plugging in the samples, which could reduce the permeability catastrophically. Our experiments showed that this did not happen. There was a loss of permeability, but it was not at all dramatic and it was certainly not a showstopper. In that view, our experiments relieved INEOS from the worry, and they consider further development.

What are the important things to focus on for younger geoscientists and petroleum engineers?

Experimental work at reservoir conditions is very time consuming and there are no shortcuts. This should be communicated clearly to the project managers. Be careful and meticulous in your work, then you will get useful results from it. The climate change is real, so contribute with CCS which offers a real possibility to mitigate the greenhouse effect by removing CO₂.

Making a difference

Noreco is entering the DUC with lots of energy, competence and ambitions



The build-up of one of the world's most advanced gas fields has begun in the Danish North Sea

“ *Three production platforms and two connecting bridges have been installed at the Tyra Field 225 kilometers out in the Danish North Sea. This marks the first milestone in the build-up of one of the world's most advanced gas fields – Tyra II.*

In late August, the very first parts of Tyra II arrived in the Danish North Sea. Within a week, the Tyra East production topsides - the two wellhead topsides and one riser topside - were lifted into place with enormous precision by the world's largest crane vessel Sleipnir. The up to 40 meters high and 2,600 tons heavy topsides were installed on the jackets which are reused from the original field design.

“ *This is truly a crucial milestone in the build-up of the new Tyra II, which will become one of the world's most advanced gas fields. New technology, better monitoring and use of big data will ensure a much more efficient production and will reduce CO₂ emissions from the new facilities by 30 percent equivalent to the annual emissions of 35,000 Danish cars”, says Morten Hesselager Pedersen, Vice President, Head of the Tyra Redevelopment for TotalEnergies EP Denmark.*

Thereby the new Tyra II is starting to take shape, and once it is completed and the field reopens, it will become a central part of the Danish energy infrastructure for natural gas production. From a global perspective, Tyra II will take part in setting the standards for natural gas production and processing.

“ *The installation has been a textbook operation. All elements were carried out very well and professionally. It is fascinating because the entire operation is rehearsed almost like a theater play, where each lift and action is executed on the basis of a more than hundred pages long script. We are working with enormous constructions, and I am really impressed by our teams and how they have carried out the installation safely and with millimeter-precision”, says Morten Hesselager Pedersen.*

With the first platforms and bridges in place, a team of 300 specialists and craftsmen is now working on the large hook-up work scope. Technology, pipes and parts must be assembled, put into operation and tested.

The remaining five out of the eight new topsides including the process topside and the accommodation topside - making up the new Tyra II field - will arrive in 2022. This is followed by ►



► installation and hook up, and the restart of production from the new field is expected in June 2023. Until then, more than 1.3 million working hours will be spent offshore on the Tyra field to get everything ready.

Facts on the Tyra redevelopment

Tyra started production in 1984 but was temporarily shut-in in 2019, and installation at the Tyra field are being redeveloped and modernized. Tyra II will be the new high-tech hub for Danish natural gas and reduce CO₂ emissions by 30%.

When production of Tyra II resumes in June 2023, a continued production of natural gas is secured for at least 25 years. Thus, Tyra II becomes a central part of the Danish energy infrastructure by offering more affordable, clean and reliable energy, which both Denmark and Europe needs in the transition towards a low-emission society.

- TotalEnergies is the operator of the Tyra field on behalf of DUC - a partnership between TotalEnergies (43.2%), Noreco (36.8%) and Nordsøfonden (20%).
- The DUC partners invest a total of DKK 21 billion in redeveloping the Tyra field, which makes it the largest Danish oil and gas investment ever.

- Tyra is Denmark's largest natural gas field, and the field is a center for processing and exporting more than 90% of the natural gas produced in the Danish North Sea.
- Production and export from the field were temporarily closed in September 2019, and the field will reopen in June 2023. It is expected that Tyra will reach a peak production corresponding to 60,000 barrels per day.
- A redevelopment of the Tyra field is necessary due to the field's natural subsidence of the chalk reservoir after many years of production. The platforms have sunk approximately 5 meters over the past 30 years, which has reduced the distance between the sea and the topsides.
- The redevelopment of the Tyra field includes three main elements: decommissioning as well as recycling and disposal of the old Tyra platforms; recycling and extending the current platform legs on six of the platforms with 13 meters, which will have new topsides; a completely new process platform and a completely new accommodation platform.
- More than 70 local companies in the offshore sector in and around Esbjerg contribute to Tyra II.



Energy Security during the Energy Transition

Hans Horikx

DTU - Centre for Oil and Gas

In the previous newsletter I talked about the cost of renewable energy, and referred to the Net Zero Emissions report by the International Energy Agency (IEA). In this report the IEA touches upon the topic of energy security, as there are other sides to the energy coin than sustainability, such as economics and security. After all, affordable and reliable energy are vital to survival and attempts to force radical change by ending conventional energy sources could be extremely damaging to the economy.

With regards to energy security the IEA report raises many points: concerns on price volatility, additional costs in case demand exceeds supply of renewable energy, reliance on electricity systems that are vulnerable to disruptions, and reliance on critical minerals. However, it fails to mention that all the extra spending on green energy doesn't necessarily make energy supply more secure.

Petrol shortages in the UK and recently elevated gas prices everywhere in the EU have demonstrated the importance of uninterrupted energy supply to consumers. The general public take many things for granted and may not be aware what a fantastic logistical achievement the current energy market is. Many people assume that gasoline simply turns up at their petrol station, that gas enters their house from a pipe in the ground and that electricity starts at the sockets in their house. Most have learned to care about the carbon footprint of different forms of energy, but who really understands how that energy actually arrived in their house or their car, or how easily that supply could be interrupted? For a Petroleum Engineer these questions may sound trivial but for most other people they're not, and most people would not worry about energy security until it is too late.

Are renewable energy forms not meant to make energy supply more secure then? At first sight that's what many would think, with power being generated locally, supply would be independent of unstable regimes or unreliable transport routes. Reality is regrettably different, the sun and the wind are plentiful but ironically much less reliable energy sources than the mineral fuels extracted from great underground depths. What's more, in order to store and distribute the electrical power generated

through renewable means and to meet demand day and night, momentous investments are required in infrastructure, transportation and storage that can result in more environmental damage than many would want to admit and an undesirable dependence on suppliers of the metals and minerals that are necessary for an electrified world economy.

Energy independence is a laudable goal, and Denmark has benefitted greatly from its conventional energy independence during the past 35 years or so, which has also been an era of energy security. But what is the best way to guarantee energy security going forward with renewable energy sources? The IEA defines energy security as the uninterrupted availability of energy sources at an affordable price. Its long- and short-term aspects are:

- Long-term energy security mainly deals with timely investments to supply energy in line with economic developments and environmental needs.
- Short-term energy security focuses on the ability of the energy system to react promptly to sudden changes in the supply-demand balance.

Long-term energy security is being dealt with under the green energy transition by addressing the long-term goals of reduced carbon emissions and a different model for economic development, which are political choices that may or may not be voluntary or consumer driven. The impact of these choices will be felt far into the future and are therefore considered to be of low political risk. Surprisingly so, since there could be unintended consequences to rising energy costs and to becoming dependent on unpredictable countries supplying renewable technology and raw materials.

On the other hand, short-term energy security is politically much more critical when it comes to obtaining support by the population. There are technical challenges in storage and distribution of green energy that haven't yet been solved. Taxpayers, consumers and voters expect their government to protect their interests, and uninterrupted access to energy and goods rank very high in that respect, next to protection of life and property. ▶▶

► It would be unwise for any government to gamble its political survival on policies that might cause avoidable energy shortages resulting from wishful thinking or poor planning. Voters would not tolerate such a situation for very long. What it boils down to is that reliable conventional energy sources should only be switched off in a gradual manner once the various alternative renewable forms are ready to replace them, and are proven equally reliable.

It's re-assuring to witness that the various levels of Danish government and energy industry have so far avoided energy shortages such as those experienced elsewhere in the world. The electricity grid has been able to absorb wind energy supply fluctuations thanks to integration with networks of international partners, particularly Norway, Sweden and Germany. Many power stations can flexibly deal with different fuel types, from

biomass and waste to gas and coal, and excess heat is commonly used for district heating, making the overall process very efficient and keeping the carbon footprint low. Diversification of energy supply reduces Denmark's vulnerability to temporary shortages in any particular area. Moreover, plans to capture CO₂ from central sources and store it in underground reservoirs will enable the Danish energy system to remain robust via zero emission conventional means while transitioning to increasing levels of renewable energy forms.

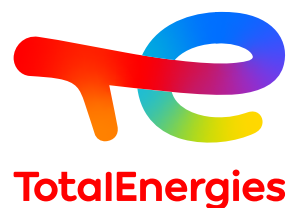
If government can continue to ensure that energy supply remains secure and affordable for consumers then voters are likely to support the green transition. This may however change if costs rise too high or if the supply chain gets interrupted too long. A combination of technical competence and political skill will be required to address these vital challenges.



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